CLAIMS

We claim:

1. A two-way asymmetric communication system having independently scalable upstream and downstream paths that enable remote data processor devices to communicate with a server, said system comprising:

a common routing/switching backplane for providing intercommunication services among multiple communication devices including said server,

an independent upstream controller in communication with said backplane operating in accordance with an upstream protocol for receiving information packets from said remote data processor devices, said upstream controller including network operating algorithms for analyzing response packets transmitted by said downstream controller to determine operational status of an identified remote data processor device,

an independent downstream controller in communication with said backplane for transmitting data packets to said remote data processor devices in accordance with a downstream protocol, said independent downstream controller being operative to transmit control packets directed to an identified remote data processor device that instructs said device to respond with predetermined information in accordance with said control packet, and

a network manager in communication with said independent upstream and downstream controllers through said backplane for effecting management of two-way communications between said remote data processor devices and said server.

2. The two-way communication system as recited in claim 1 including multiple sub-channels in a downstream path and a bandwidth manager for dynamically balancing traffic loads in the downstream path in order to provide

greater use of available downstream channels according to give in traffic conditions.

3. The two-way communication system as recited in claim 1 wherein said independent upstream and downstream controllers comprise separate and independent hardware components including interface cards mounted in a rack.

4. The two-way communication system as recited in claim 1 wherein said common switching/routing backplane comprises an Ethernet LAN hub.

5. The two-way communication system as recited in claim 1wherein said downstream controller effects transmission of control packets that detect assignment of upstream transmit frequency utilized by a remote processor device, and said remote processor device assembles and transmits response packets which contain information indicative of the upstream transmit frequency being used by said remote processor device.

6. The two-way communication system as recited in claim 1 wherein said downstream controller applies forward error correction to control packets transmitted on said downstream channel.

7. The two-way system as recited in claim 5 wherein said foward error correction includes Reed Solomon encoding and interleaving of information packets.

8. The two-way communication system as recited in claim 1 wherein said remote device includes operating routines for assembling and transmitting Viterbi-encoded upstream packets.

9. The two-way communication system as recited in claim 1 wherein said network manager effects configuration management of said remote devices by effecting issuance of control packets that perform at least one of: assigning an upstream response frequency; adjusting an upstream transmiter; assigning an IP address; assigning a local MAC address; assigning an upstream transmit data rate; effecting reporting of status; effecting a transmission of data by said remote processor device; assigning a shared channel for use by said remote processor device; and assigning a dedicated channel for use by a remote processor device.

10. In a two-way asymmetric communication system for effecting communications between a server and a plurality of remote processor devices over a high-speed downstream channel and a lower speed upstream channel interposed between said server and said remote processor devices, the improvement comprising:

a shared medium including plural channels that respectively convey information to remote devices in communication with said server, and

a network management system for monitoring usage in said plural channels and balancing traffic loads in said plural channels by distributing traffic therein in a way to increase utilization of available bandwidth over said shared medium.

11. The improvement as recited in claim 10 wherein said network management system balances traffic loads in accordance with at least one of available bandwidth in said shared downstream medium, utilization of respective channels in the downstream medium, detecting desired levels of service requested by remote data processor devices, utilizing class of service assigned to said remote data processor devices and determining the amount of guaranteed bandwidth assigned to others of said remote devices.

12. The improvement as recited in claim 10 wherein said network management system effects assignment of upstream transmit frequencies to remote processor devices in accordance with available upstream channels and quality of said upstream channels.

13. The improvement as recited in claim 10 wherein said network management system provides forward error correction to control packets transmitted over said downstream channel to said remote processor devices.

14. In an asymmetric communication system for effecting communications between a server and a plurality of remote processor devices over a high-speed downstream channel and a lower speed upstream channel interposed between said server and said remote processor devices, the improvement comprising:

an independently operating downstream controller for transferring information to said remote processor devices,

an independently operating upstream controller for receiving information from said remote processor devices, and

a configuration manager utilizing each of said upstream and downstream controllers to assign and, by obtaining feedback from said remote processor devices, to confirm assignment of an IP address to a remote processor device based on a detected identification of said remote processor device when connected to and operating on said network.

15. The asymmetric network as recited in claim 14 wherein said configuration manager further includes routines for constructing upstream power levels at which said remote processor device is to transmit, and said remote processor device transmits the response packet containing information confirming assignment of its transmit power level.

16. The asymmetric network as recited in claim 15 wherein said configuration manager and said remote processor device iteratively issues instructions to set the power level, to transmit at said set power level and to continue to reset said power level until the desired power level is reached as detected at said upstream controller.

17. The two-way asymmetric network as recited in claim 14 wherein said configuration manager further includes routines for adjusting frequency assignments to be utilized by said remote processor devices transmit upstream to said upstream controller.

18. The two-way asymmetric network as recited in claim 14 wherein said upstream controller includes digital signal processors for analyzing and registering in a memory the quality of upstream transmissions by said remote processor devices.

19. The two-way asymmetric network as recited in claim 18 wherein assignment of upstream channels to send remote processor devices is made in accordance with information analyzed by said digital signal processors.

20. The two-way asymmetric network as recited in claim 18 wherein said downstream controller utilizes quadrature amplitude modulation techniques for transmitting digital beta signals downstream to said remote processor devices.

21. The two-way asymmetric network as recited in claim 20 wherein said remote processor devices utilizes VSB modulation techniques for encoding information signals transmitted upstream to said upstream controller.

22. The two-way asymmetric network as recited in claim 14 wherein said remote processor device includes a processor for receiving network operating software automatically downloaded from configuration manager.

23. The two-way asymmetric network as recited in claim 14 wherein said configuration manager issues control packets that assign one of shared channel used and dedicated channel use two-way remote processor device.

24. The asymmetric network as recited in claim 14 wherein said configuration manager issues the control packet containing information that assigns the class of service level for a remote processor device connected to said network.

25. In a wireless communication system for effecting asymmetric communications between a server and a plurality of remote processor devices over a high-speed RF broadcast channel and a lower speed upstream channel interposed between said server and said remote processor devices, the improvement comprising:

an independently operating downstream controller for broadcasting information to said remote processor devices,

an independently operating upstream controller for receiving information from said remote processor devices, and

a configuration manager in communication with each of said upstream and downstream controllers and being operative to assign and, by obtaining feedback from said remote processor devices, to confirm assignment of an IP address to a remote processor device based on a detected identification of said remote processor device when connected to and operating on said network.

26. The wireless network as recited in claim 25 wherein said RF broadcast channel is carried in at least one of: a CATV broadcast network; a direct broadcast satellite network; and a cellular network.

27. The wireless network as recited in claim 25 further including a configuration manager that includes routines for instructing upstream power levels at which said remote processor device is to transmit, and said remote devices transmit the response packet containing information confirming assignment of its transmit power level.

28. The wireless network as recited in claim 25 further including a configuration manager that transmits control packets to said remote devices to effect configuration thereof according to configuration parameters, and said remote devices transmit the response packet containing information confirming operation of said remote device in accordance with said configuration parameters.

29. The wireless network as recited in claim 28 wherein said configuration parameters include at least one of: upstream channel assignment; address assignment; transmission credit value; and bandwidth allocation.

30. In an asymmetric network having respective upstream and downstream communication paths for enabling a plurality of remote devices to receive information from a host over a shared medium, the improvement comprising:

plural downstream channels operating over said shared medium, and

a network manager for providing bandwidth management of downstream bandwidth allocated to respective remote devices over said plural downstream channels.

31. The improvement as recited in claim 30 wherein said network manager further includes operative routines for detecting service requests for requested bandwidth, for assessing bandwidth utilization of respective downstream channels on said shared medium, and for assigning additional downstream bandwidth to remote devices in accordance with said utilization and service requests.

32. The improvement as recited claim 30 wherein said network manager further includes operative routines for balancing loads among respective channels on a downstream medium of said asymmetric network.

33. The improvement as recited in claim 30 wherein said network manager includes operative routines for monitoring channel usage in the upstream path shared by multiple remote devices and for allocating upstream bandwidth to remote devices in accordance with available bandwidth and service requests.

34. The improvement as recited in claim 31 wherein said remote devices include operative routines for determining and gathering statistical data relating to operating characteristics thereof and for reporting said statistical data to said network manager.

35. The asymmetric network as recited in claim 34 wherein said network manager utilizes said reported statistical data for allocating upstream channels to said remote devices.

36. In a wireless asymmetric network having respective upstream and downstream communication paths for enabling a plurality of remote devices to receive information from a host over a broadcast medium, the improvement comprising:

plural downstream channels operating within said shared medium and

a network manager for providing bandwidth management of downstream bandwidth allocated to respective remote devices over said plural downstream channels.

37. In a wireless network having respective upstream and downstream communication paths for enabling a plurality of remote devices to receive information from a host over a broadcast medium, a method for allocating downstream bandwidth comprising the steps of:

providing plural downstream channels operating within said shared medium, and

allocating downstream bandwidth to respective remote devices over said plural downstream channels in accordance with bandwidth utilization, available bandwidth, and demand for bandwidth by said remote devices.

38. The method as recited in claim 37 further including the step of configuring said remote devices in accordance with control packets transmitted on a downstream channel.

39. The method as recited in claim 38 wherein said configuring includes assigning at least one of an address, upstream channel, transmit power level and transmission credit level.

40. A method for managing bandwidth in an asymmetric network and multiple remote devices in communication with a server over a shared medium, said method comprising:

monitoring channel usage on a downstream medium to detect available spectrum,

detecting a request for service by at least one remote device connected to said asymmetric network, and

allocating bandwidth from a portion of available spectrum on said downstream channel.

41. The method as recited in claim 40 further including the step of balancing the load substantially equally among plural channels of a downstream medium.

42. The method as recited in claim 40 wherein said network include plural upstream channels, further including the steps of monitoring channel usage in the upstream channels, determining available bandwidth or available channels in said upstream channels, detecting service requests for the transmission of upstream data from at least one remote device, and allocating available upstream bandwidth to said remote devices in said upstream channels in accordance with detection of said service requests.

43. The method as recited in claim 40 wherein said network includes plural upstream channels, further including gathering statistical data related to operating quality of said upstream channels, determining on the basis of statistical data the operative quality of said upstream channels, and marking respective upstream channels as available, unusable in accordance with said operating quality.

44. The method as recited in claim 43 further including the step of assigning upstream channels in accordance with operating quality.

45. The method is recited in claim 44 wherein said operatimg quality includes at least one of signal-to-noise ratio, CRC error rate, noise floor level, and signal quality.

46. The method as recited in claim 40 wherein said shared medium comprises one of: an RF broadcast medium; a direct broadcast satellite network; and a CATV broadcast network.

47. The method as recited in claim 46 wherein said asymmetric network includes at least one upstream channel that is carried in a medium selected from at least one of: a PSTN network; a router return network; an RF broadcast network; an RF transmission network; and a CATV network.

48. The method as recited in claim 40 further including the step of returning upstream information from said remote device by a telephony return link.

49. The method as recited in claim 40 further including transmitting information in said network in accordance with at least one of: an internet protocol; and an ATM protocol.

50. An asymmetric network including at least one downstream channel and plural upstream channels, said network utilizing control and response packets for managing configuration of multiple remote devices that receive information from a host over a shared downstream medium, said network comprising:

a network manager for generating a control packet that contains control information for effecting at least one of: upstream channel assignment; transmit power level; address assignment; and data transmission credit level, and

a controller located in said remote device that responds to said control packet by transmitting information on said upstream channel in accordance with at least one of said upstream channel assignment, transmit power level, address assignment or data transmission credit level.

51. The asymmetric network as recited in claim 50 wherein said control packet effects a request for status information and said response packet generated by said controller reports requested status to said network manager.

52. The asymmetric network as recited in claim 50 wherein said controller of said remote device generates a response packet which confirms configuration thereof by reporting to said network manager at least one of: said assigned upstream channel; transmit power level; address assignment; and transmission credit used by said remote device.

53. The asymmetric network system is recited in claim 50 wherein said network manager includes a downstream controller that encapsulates said control packets with header and trailer information, and transmits said control packet over said downstream medium.

54. The asymmetric network as recited in claim 53 including a downstream controller that encapsulates said control packets in accordance with an IP protocol.

55. The asymmetric network as recited claim 53 including a downstream controller that encapsulates said control packets in accordance with an ATM protocol.

56. The asymmetric network as recited in claim 50 wherein said network manager downloads network operating routines to said remote devices in order to alter the rules of interpreting said control packets in accordance with updated algorithms.

57. The asymmetric network as recited in claim 50 wherein said network manager provides configuration management of at least one of: a remote device address; transmitter power level assignment; frequency assignment of upstream transmit channel; and time slot assignment of an upstream channel.

58. The asymmetric network as recited in claim 50 wherein said network manager issues control packets to effect gathering and reporting of traffic statistics.

59. The asymmetric network as recited in claim 50 wherein said network manager monitors and reports usage activity of said remote devices.

60. The asymmetric network as recited in claim 50 including a downstream controller that applies forward error correction to control packets transmitted on said downstream medium.

61. The asymmetric network as recited in claim 50 including a downstream controller that applies encryption to information packets transmitted on said downstream medium.

62. The asymmetric network as recited in claim 50 wherein said shared medium comprises one of an RF broadcast medium, a CATV broadcast medium, an RF transmission and a direct satellite broadcast medium.

63. The asymmetric network as recited in claim 62 wherein said asymmetric network includes an upstream medium that comprises one of: a PSTN network; a CATV network; an RF transmission; and a router return network.

64. An asymmetric network system including upstream and downstream channels and utilizing control and response packets for managing bandwidth and configuration parameters of multiple remote devices in communication with a host over a shared downstream medium, said network comprising:

a first controller located at a head end of said asymmetric network system, to generate a configuration control packet that contains control information for effecting at least one of upstream channel assignment, transmit power level, address assignment, and data transmission credit level,

a second controller located at a head end of said network management system to generate a bandwidth management control packet that effects allocation of bandwidth on said shared downstream medium to said remote devices, and

a third controller located at at least one of said remote devices that responds to said control packet by transmitting information on said upstream channel in accordance with at least one of said upstream channel assignment, transmit power level, address assignment and data transmission credit level.

65. The asymmetric network system as recited in claim 64 wherein said first controller generates said configuration control packet according to registration information provided by a network operator including IP address assignment and account administration information.

66. The asymmetric network system as recited in claim 64 wherein said first controller generates said configuration control packet for a given remote device according to available unused channels, channel usage by other remote devices, available upstream bandwidth, bandwidth guaranteed to other remote devices, channel usage, class of service of said given remote device and requested demand for bandwidth of said given remote device.

67. The asymmetric network system as recited in claim 64 wherein said downstream medium comprises a wireless broadcast medium.

68. The asymmetric network system as recited in claim 64 wherein said downstream medium comprises a telephony return upstream channel.

69. The asymmetric network system as recited in claim 64 wherein said downstream medium comprises an RF broadcast and said upstream channel is carried in an RF transmission.

70. A method for managing configuration of a remote device in an asymmetric network wherein plural remote devices communicate with a host over a shared downstream medium of said asymmetric network, said method comprising the steps of:

generating a control packet that contains control information to effect at least one of: upstream channel assignment; transmit power level assignment; address assignment; and data transmission credit level,

transmitting said control packet over said downstream medium to said plural remote devices,

receiving said control packet by at least one of said plural remote devices, and

said remote device responding to said control packet to effect operation of at least one of said upstream channel assignment, power level assignment, address assignment and data transmission credit level.

71. The method as recited claim 70 further including the step of encapsulating said control packet in accordance with a communication protocol prior to transmitting said control packet over said downstream medium.

72. The method as recited in claim 70 wherein said encapsulating step includes forming packets in accordance with an IP protocol.

73. The method as recited in claim 70 wherein said encapsulating step includes forming packets in accordance with an ATM protocol.

74. The method as recited in claim 70 further including the steps of downloading network operating software to said remote devices, and said remote devices executing said downloaded network operating software to generate response packets in response to said control packets.

75. The method as recited in claim 70 further including the step of gathering and reporting traffic user statistics by said remote devices.

76. The method as recited in claim 70 further including the step of monitoring and reporting user activity in said asymmetric network.

77. The method as recited in claim 70 further including the step of applying forward error correction to control packets transmitted over said downstream medium.

78. The method as recited in claim 70 further including the step of applying encryption to information packets transmitted to said remote devices over said downstream channel.

79. The method as recited in claim 74 further including downloading network operating software that alters the format of said control and response packet in order to change response characteristics of said remote devices.

80. A method for managing bandwidth allocated to a remote device in an asymmetric network wherein plural remote devices communicate with a host over a shared downstream medium of said asymmetric network, said method comprising the steps of:

determining downstream bandwidth utilization among plural remote devices and said asymmetric network,

determining unused spectrum in said downstream channel,

polling said remote devices to determine bandwidth demand of at least one of said remote devices, and

allocating unused spectrum to at least one of said remote devices in accordance with said downstream bandwidth utilization.

81. The method as recited claim 80 wherein said allocating step further includes the step of generating a control packet to effect said allocating, sending said control packet to a downstream controller, and encapsulating said control packet by said downstream controller in accordance with a communication protocol prior to transmitting said control packet over said downstream channel.

82. The method as recited in claim 81 wherein said encapsulating step includes forming packets in accordance with an IP protocol.

83. The method as recited in claim 81 wherein said encapsulating step includes forming packets in accordance with an ATM protocol.

84. The method as recited in claim 80 further including the steps of downloading network operating software to set remote devices, and said remote devices executing said downloaded network operating software to generate response packets in response to said control packets.

85. The method as recited in claim 80 further including the step of gathering and reporting traffic user statistics by said remote devices.

86. The method as recited in claim 80 further including the step of monitoring and reporting user activity in said asymmetric network.

87. The method as recited in claim 81 further including the step of applying forward error correction to said control packet transmitted over said downstream channel.

88. The method as recited in claim 81 further including the step off applying encryption to information packets transmitted to said remote devices over said downstream channel.

89. The method as recited in claim 81 wherein said downstream medium comprises one of: an RF broadcast network; a direct satellite broadcast network; and a CATV network.

90. A remote device for use in an asymmetric network communication system which includes at least one high-speed downstream channel operating over a shared medium, said remote device comprising:

an RF interface for receiving high-speed data transmission over at least one of said downstream channels,

a microprocessor controller for receiving control packets from a network management system, said control packet including control information for effecting control of at least one of upstream channel assignment, transmiter level, remote address assignment, and transmission credit value allocated to said remote device, and

said microprocessor controller being responsive to said control packet to effect operation at said remote interface of at least one of said upstream channel

assignment, transmit power level, remote address assignment and transmission credit value.

91. The remote device as recited in claim 90 wherein said microprocessor controller confirms the operation of said remote interface at at least one of said upstream channel assignment, transmit power level, remote address assignment and transmission credit value by returning a response packet to said network management system confirming said operation.

92. The remote device as recited in claim 90 further including operative routines for gathering statistical operational data about said remote device, and for reporting said statistical operating data to said network management system.

93. The remote device as recited in claim 90 wherein said microprocessor controller receives network operating software downloaded from said network management system, said network operating software being used for interpreting control packets to effect operation of said remote interface.

94. The remote device as recited in claim 90 wherein said microprocessor controller unencapsulates said control packets in order to decipher the information content thereof.

95. The remote device as recited in claim 90 further including an upstream transmit power responsive to said microprocessor controller for transmitting upstream data packets to said network management system.

96. The remote device as recited in claim 90 wherein said microprocessor controller applies error correction to said information packets transmitted upstream to said network management system.

97. The remote device as recited in claim 90 further including a second RF interface for effecting the transfer of RF data signals in an upstream transmission to said network management system.

98. The remote device as recited in claim 90 further including a cable return interface for generating upstream information and response packets for transmission to said network management system.

99. The remote device as recited in claim 90 further including network operating software for use with a telephone return modem of a remote computer to effect transmission of upstream packets to said network management system.

100. A method for use in a remote device in communication with an asymmetric network communication system including at least one high-speed downstream channel operating over a shared medium, said method comprising the steps of:

receiving from a network management system an information packet containing configuration data including at least one of a remote device address assignment, upstream channel assignment, transmit power level and a transmission credit value, and

effecting operation of said remote device in accordance with at least one of said remote device address assignment, upstream channel assignment, transmitter power level and transmission credit value.

101. The method as recited in claim 100 further comprising the step of:

reporting operation of said remote device to a network management system, said reporting including confirming the operation in accordance with at least one of said address assignment, channel assignment, transmit power level and credit value.

102. The method as recited in claim 100 further including the steps of gathering statistical operation of data about said remote device and reporting said statistical operating data to a network management system.

103. The method as recited in claim 100 further comprising the step of Viterbi-encoding packets that are transmitted upstream to a network management system.

104. The method as recited in claim 100 further including the step of applying error correction to said information packets transmitted upstream to said network management system.